

CONSTRUCTION CORE

COURSE DESCRIPTION

***Construction Core* is a course that will introduce students to basic skills and knowledge applicable to all construction trades. Topics covered include safety, construction drawings, site layout, hand and power tools, linear and angular measurements, and application of algebraic and geometric principles to construction problems.**

Prerequisite(s): None

Note: Career Management Success is required as a part of the Trade and Industrial Education student's concentrator sequence or technical path in the Manufacturing, Construction, and Transportation sub-clusters.

Recommended Credits: 1 with a minimum of 72.5 hours dedicated to the *Construction Core* curriculum to meet National Center for Construction Education and Research standards and the Tennessee Department of Education

Recommended Grade Level(s): 10th

CONSTRUCTION CORE STANDARDS

- 1.0 Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.
- 2.0 Students will identify and demonstrate basic principles of safety procedures used in the construction industry.
- 3.0 Students will interpret drawings and written specifications and relate them to the construction layout.
- 4.0 Students will trace the growth and development of the construction industry.
- 5.0 Students will evaluate career opportunities and career paths within the construction industry.
- 6.0 Students will identify, select, inspect, safely use, maintain, and store hand tools.
- 7.0 Students will identify, select, inspect, safely use, maintain, and store power tools.
- 8.0 Students will make and lay out linear and angular measurements.
- 9.0 Students will transfer mathematics concepts to solve problems encountered in the construction industry.
- 10.0 Students will rig and move materials and equipment.
- 11.0 Students will demonstrate proficiency in creating two- and three-dimensional scale drawings.

CONSTRUCTION CORE

STANDARD 1.0

Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.

LEARNING EXPECTATIONS

The student will:

- 1.1 Cultivate leadership skills.
- 1.2 Participate in SkillsUSA-VICA or similar organization.
- 1.3 Assess situations within the school, community, and workplace and apply values to develop and select solutions.
- 1.4 Demonstrate the ability to work cooperatively with others.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 1.1.A Takes initiative in meetings to actively influence the results of deliberations.
- 1.1.B Uses critical-thinking and consensus building skills in group deliberations.
- 1.2.A Applies high ethical standards to personal, community, and professional situations.
- 1.2.B Participates and conducts meetings according to accepted rules of parliamentary procedure.
- 1.3.A Analyzes simulated workplace situations and uses problem-solving and critical-thinking techniques to suggest solutions the problem.
- 1.3.B Analyzes socio-economic conflicts associated with the construction industry and applies values to evaluate possible ways to mitigate the conflicts.
- 1.4.A Participates in a committee.
- 1.4.B Contributes to a group project.

SAMPLE PERFORMANCE TASKS

These are sample projects of the type and scale recommended to address one or more of the learning expectations for this standard. Other projects can be used at the instructor's discretion.

- Create a leadership inventory and use it to conduct a personal assessment.
- Participate in various SkillsUSA-VICA or similar programs and/or competitive events.
- Evaluate a civic project within the school, community, and/or workplace and evaluate the expected long-term effects of the project.
- Prepare a meeting agenda for a school or a community meeting.
- Attend the meeting of a professional organization.
- Participate in a design team to complete an assigned project.

INTEGRATION LINKAGES

SkillsUSA-VICA *Professional Development Program*, SkillsUSA-VICA, Communication and Writing Skills, Teambuilding Skills, Research, Language Arts, Sociology, Psychology, Algebra, Geometry, Applied Communication, Social Studies, Problem Solving, Interpersonal Skills, Employability Skills, Critical-Thinking Skills, SCANS (Secretary's Commission on Achieving Necessary Skills), Chamber of Commerce, Colleges, Universities, Technology Centers, and Employment Agencies

CONSTRUCTION CORE

STANDARD 2.0

Students will identify and demonstrate basic principles of safety procedures used in the construction industry.

LEARNING EXPECTATIONS

The student will:

- 2.1 Demonstrate a positive attitude regarding safety practices and issues.
- 2.2 Use personal protective equipment.
- 2.3 Demonstrate safe operating procedures with tools and equipment, such as hand and power tools, ladders, scaffolding, and lifting equipment.
- 2.4 Follow safe procedures for lifting heavy objects.
- 2.5 Explain the importance of the HazCom (Hazard Communication Standard) requirement and MSDSs (Material Safety Data Sheets).
- 2.6 Adhere to responsibilities, regulations, and company policies regarding reporting of accidents.
- 2.7 Practice fire prevention in dealing with various flammable materials.
- 2.8 Demonstrates appropriate construction-related safety procedures.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 2.1.A Is attentive during safety discussions.
- 2.1.B Responds positively to instruction, advice, and correction regarding safety issues.
- 2.1.C Does not deliberately create or increase hazards, such as by horseplay, practical jokes, or creating distractions.
- 2.2.A Uses the recommended personal protective equipment for the assigned task.
- 2.3.A Inspects power tools for intact guards, shields, insulation, and other protective devices.
- 2.3.B Prior to use, inspects extension cords for the presence of a functional ground connection.
- 2.3.C Operates and maintains tools in accordance with manufacturer's instructions and as required by regulation or company policy.
- 2.3.D Properly places and secures ladders and scaffolding prior to use.
- 2.4.A Demonstrates the ability to manually lift a heavy object in a safe manner.
- 2.4.B Uses safe procedures, including proper rigging, to hoist heavy objects.
- 2.5.A Retrieves MSDSs and identifies the health hazards associated with materials.
- 2.5.B Explains the employee's role under HazCom (Hazard Communication Standard).
- 2.6.A Reports all injuries to self to the immediate supervisor/instructor.
- 2.6.C Complies with personal assignments regarding emergency assignments.
- 2.7.A Describes fire prevention and fire fighting techniques.
- 2.7.B Explains the classes of fires and the types of extinguishers used on each.
- 2.7.C Operates one of the fire extinguishers found on construction job sites.
- 2.8.A Passes with 100 % accuracy a written examination relating safety issues.
- 2.8.B Passes with 100% accuracy a performance examination relating to safety.
- 2.8.C Maintains a portfolio record of written safety examinations and equipment examinations for which the student has passed an operational checkout by the instructor.

SAMPLE PERFORMANCE TASKS

These are sample projects of the type and scale recommended to address one or more of the learning expectations for this standard. Other projects can be used at the instructor's discretion.

- Complete a site evaluation for safe practices.
- Appraise the job site for safety hazards, list common causes of typical accidents and injuries, and outline a safety corrections program.
- Calculate the cost of safety corrections needed.
- Conduct a roundtable discussion on the problems of substance abuse on the job site.
- Complete a report on injuries, accidents, and near misses, including how each could be prevented.
- Explain the tags used to identify a scaffold condition.
- Use proper, professional terms relating to the construction industry.

INTEGRATION/LINKAGES

SkillsUSA-VICA *Professional Development Program*, SkillsUSA-VICA, Communication and Writing Skills, Teambuilding Skills, Research, Language Arts, Sociology, Psychology, Algebra, Geometry, Applied Communication, Social Studies, Problem Solving, Interpersonal Skills, Employability Skills, Critical-Thinking Skills, SCANS (Secretary's Commission on Achieving Necessary Skills), National Center for Construction Education and Research (NCCER), Chamber of Commerce, Colleges, Universities, Technology Centers, and Employment Agencies

CONSTRUCTION CORE

STANDARD 3.0

Students will interpret drawings and written specifications and relate them to the construction layout.

LEARNING EXPECTATIONS

The student will:

- 3.1 Interpret dimensions and locations of components that are explicitly dimensioned in construction drawings and written specifications.
- 3.2 Scale dimensions that are not explicitly included in construction drawings.
- 3.3 Interpret plan and elevation views shown in construction drawings.
- 3.4 Recognize and interpret lines and symbols commonly used in construction drawings.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 3.1.A Relates information on prints to real parts and locations.
- 3.1.B Explains the tolerances associated with dimensions in construction drawings.
- 3.1.C Uses dimensions indicated on a drawing to make calculations, such as area and volume.
- 3.2.A Uses the scale of a drawing to determine locations not explicitly dimensioned.
- 3.2.B Uses the scale of a drawing to determine dimensions not explicitly shown on drawing.
- 3.2.C Uses dimensions scaled from a drawing to make calculations, such as area and volume.
- 3.3.A Interprets three-dimensional features found in construction drawings.
- 3.4.A Distinguishes object lines, dimension and extension lines, center lines, section lines, and other lines commonly found in construction drawings.
- 3.4.B Identifies symbols commonly used in construction drawings, including material, window and door, electrical, plumbing, HVAC, and plot plan and survey symbols.

SAMPLE PERFORMANCE TASKS

These are sample projects of the type and scale recommended to address one or more of the learning expectations for this standard. Other projects can be used at the instructor's discretion.

- Calculate the number of square feet in a house from the information given on a floor plan.
- Determine the number of exits available in a building based on construction drawings.
- Plan fire escape routes based on construction drawings or floor plans for their school.
- Estimate walking distances for each unique fire escape route suggested in the preceding project.
- Determine the rise and run of a stairway depicted on a construction drawing.
- Identify number and location of convenience electric outlets depicted on a construction drawing.

INTEGRATION/LINKAGES

SkillsUSA-VICA *Professional Development Program*, SkillsUSA-VICA, Communication and Writing Skills, Teambuilding Skills, Research, Language Arts, Sociology, Psychology, Algebra, Geometry, Applied Communication, Social Studies, Problem Solving, Interpersonal Skills, Employability Skills, Critical-Thinking Skills, SCANS (Secretary's Commission on Achieving

Necessary Skills), NCCER, Chamber of Commerce, Colleges, Universities, Technology Centers,
and Employment Agencies

CONSTRUCTION CORE

STANDARD 4.0

Students will trace the growth and development of the construction industry.

LEARNING EXPECTATIONS

The student will:

- 4.1 Analyze the evolution of the construction industry.
- 4.2 Analyze current cultural and economic indicators to anticipate future trends in the construction industry.
- 4.3 Explore economic aspects, the free enterprise system, and the role of government as they relate to the construction industry.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 4.1.A Compares and contrasts construction techniques used in previous centuries versus current methods.
- 4.1.B Analyzes recent changes in the construction industry and describes the effects of the changes.
- 4.2.A Identifies key influences for change within the industry, which are based on societal, cultural, educational, and economic trends.
- 4.3.A Collects and presents information related to government agencies and legislation concerning the construction industry.
- 4.3.B Describes the effects of market factors on the construction industry.

SAMPLE PERFORMANCE TASKS

These are sample projects of the type and scale recommended to address one or more of the learning expectations for this standard. Other projects can be used at the instructor's discretion.

- Research industry history, trends and construction pioneers from the Internet, media research interviews, and other research sources.
- Debate the economic impact of the free enterprise system on the construction industry.
- Conduct interviews and gather data from individuals concerning the growth and development of the construction industry.

INTEGRATION/LINKAGES

Language Arts, Foreign Language, Science, Algebra, Geometry, Social Studies and Government, History, Criminal Justice, Computer Skills, Research and Writing Skills, Communication Skills, Teamwork Skills, Leadership Skills, SCANS (Secretary's Commission on Achieving Necessary Skills), SkillsUSA-VICA, ABC (Associated Builders and Contractors), AGC (Associated General Contractors), NCCER (National Center for Construction Education Research), Department of Labor

CONSTRUCTION CORE

STANDARD 5.0

Students will evaluate career opportunities and career paths within the construction industry.

LEARNING EXPECTATIONS

The student will:

- 5.1 Examine various fields of work and related occupations within the construction industry.
- 5.2 Explain the titles, roles, and functions of individuals engaged in construction careers, including opportunities for advancement.
- 5.3 Investigate employment and entrepreneurial opportunities.
- 5.4 Evaluate personal characteristics required for working in the construction industry.
- 5.5 Investigate post-secondary education, professional organizations, and trade publications appropriate for continuing education.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 5.1 Researches at least one field of work of interest in the construction industry and the related occupations.
- 5.2.A Differentiates between various construction fields and the types of work performed by each.
- 5.2.B Compares the roles and functions of people in construction careers.
- 5.3.A Researches and develops a projection of industry trends related to career opportunities.
- 5.3.B Compares career plans for various career paths in the construction industry.
- 5.4 Profiles personal characteristics, which are beneficial to the success of a professional in the construction industry.
- 5.5 Sets up and maintains a file outlining professional organizations, publications, current issues, future trends, and emerging technologies in the construction industry.

SAMPLE PERFORMANCE TASKS

- Interview construction workers in an occupation of interest about the job, including duties and employment requirements.
- Research career opportunities in the local community.
- Develop a profile of career opportunities.
- Develop a personal career plan.
- Appraise professional construction organizations and explain their purposes and ways they benefit the industry and its professionals.
- Research and present information on key individuals in the construction industry.

INTEGRATION/LINKAGES

SkillsUSA-VICA *Professional Development Program*, SkillsUSA-VICA, Communication and Writing Skills, Teambuilding Skills, Research, Language Arts, Sociology, Psychology, Algebra, Geometry, Applied Communication, Social Studies, Problem Solving, Interpersonal Skills, Employability Skills, Critical-Thinking Skills, SCANS (Secretary's Commission on Achieving Necessary Skills), Chamber of Commerce, Colleges, Universities, Technology Centers, and Employment Agencies

CONSTRUCTION CORE

STANDARD 6.0

Students will identify, select, inspect, safely use, maintain, and store hand tools.

LEARNING EXPECTATIONS

The student will:

- 6.1 Demonstrate the proper use of striking tools.
- 6.2 Demonstrate the proper use of cutting tools.
- 6.3 Demonstrate the proper use of torque producing tools.
- 6.4 Demonstrate the proper use of leveling and squaring tools.
- 6.5 Demonstrate the proper use of grinding and shaping tools.
- 6.6 Demonstrate the proper use of clamping tools.
- 6.7 Demonstrate the proper use of pulling and lifting tools.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 6.1.A Selects the appropriate striking tool, e.g., hammers and sledge hammers.
- 6.1.B Demonstrates eye-to-hand coordination and manual dexterity with striking tools.
- 6.1.C Uses safe operating practices with striking tools.
- 6.1.D Inspects and maintains striking tools.
- 6.2.A Selects the appropriate cutting tool, e.g., hand saws, chisels, knives, and planes.
- 6.2.B Demonstrates eye/hand coordination and manual dexterity with cutting tools.
- 6.2.C Uses safe operating practices with cutting tools.
- 6.2.D Inspects and maintains cutting tools.
- 6.2.E Makes precise cuts with cutting tools.
- 6.2.F Sharpens cutting tools, e.g., knives, saws, and chisels.
- 6.3.A Selects the appropriate torque-producing tool, e.g., screw drivers, wrenches, and pliers.
- 6.3.B Demonstrates eye/hand coordination and manual dexterity with torque-producing tools.
- 6.3.C Uses safe operating practices with torque-producing tools.
- 6.3.D Inspects and maintains torque-producing tools.
- 6.4.A Selects the appropriate leveling and squaring tool, e.g., builder's squares, try squares, plumb bobs, levels, and builder's levels.
- 6.4.B Demonstrates eye/hand coordination and manual dexterity with leveling and squaring tools.
- 6.4.C Uses safe operating practices with leveling and squaring tools.
- 6.4.D Inspects and maintains leveling and squaring tools.
- 6.5.A Selects the appropriate grinding and shaping tool, e.g., files, hand sanders, and grinders.
- 6.5.B Demonstrates eye/hand coordination and manual dexterity with grinding and shaping tools.
- 6.5.C Uses safe operating practices with grinding and shaping tools.
- 6.5.D Inspects and maintains grinding and shaping tools.
- 6.6.A Selects the appropriate clamping tool, e.g., vises, pipe clamps, C-clamps, hand-screw clamps, and web clamps.
- 6.6.B Demonstrates eye/hand coordination and manual dexterity with clamping tools.
- 6.6.C Uses safe operating practices with clamping tools.
- 6.6.D Inspects and maintains clamping tools.

- 6.7.A Selects the appropriate pulling and lifting tool, e.g., jacks, come-alongs, and chain falls.
- 6.7.B Demonstrates eye-to-hand coordination and manual dexterity with pulling and lifting tools.
- 6.7.C Uses safe operating practices with pulling and lifting tools.
- 6.7.D Inspects and maintains pulling and lifting tools.

SAMPLE PERFORMANCE TASKS

These are sample projects of the type and scale recommended to address one or more of the learning expectations for this standard. Other projects can be used at the instructor's discretion.

- Drive 16-penny nails into framing lumber without bending or missing the nail.
- Cut and assemble a simple section of a concrete form, using only hand tools. Verify square conditions, as appropriate.
- Assemble threaded pipe (or conduit) and fittings, and properly tighten all joints.
- Secure wood and metal for sawing and drilling operations using appropriate clamping tools.
- Use a come-along to laterally move a heavy object across the floor.

INTEGRATION/LINKAGES

SkillsUSA-VICA *Professional Development Program*, SkillsUSA-VICA, Communication and Writing Skills, Teambuilding Skills, Research, Language Arts, Sociology, Psychology, Algebra, Geometry, Applied Communication, Social Studies, Problem Solving, Interpersonal Skills, Employability Skills, Critical-Thinking Skills, SCANS (Secretary's Commission on Achieving Necessary Skills), NCCER, Chamber of Commerce, Colleges, Universities, Technology Centers, and Employment Agencies

CONSTRUCTION CORE

STANDARD 7.0

Students will identify, select, inspect, safely use, maintain, and store power tools.

LEARNING EXPECTATIONS

The student will:

- 7.1 Demonstrate the proper use of striking tools.
- 7.2 Demonstrate the proper use of cutting tools.
- 7.3 Demonstrate the proper use of torque producing tools.
- 7.4 Demonstrate the proper use of grinding and shaping tools.
- 7.5 Demonstrate the proper use of clamping tools.
- 7.6 Demonstrate the proper use of pulling and lifting tools.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 7.1.A Selects the appropriate striking tool, e.g., air hammers.
- 7.1.B Demonstrates eye/hand coordination and manual dexterity with power striking tools.
- 7.1.C Uses safe operating practices with power striking tools.
- 7.1.D Inspects and maintains power striking tools.
- 7.2.A Selects the appropriate cutting tool, e.g., power saws, planers, routers, and drills.
- 7.2.B Demonstrates eye/hand coordination and manual dexterity with power cutting tools.
- 7.2.C Uses safe operating practices with power cutting tools.
- 7.2.D Inspects and maintains power cutting tools.
- 7.2.E Makes precise cuts with power cutting tools.
- 7.2.F Sharpens power cutting tools, e.g., saw blades, planer knives, and drill bits.
- 7.3.A Selects the appropriate power torque-producing tool, e.g., power drivers and impact wrenches.
- 7.3.B Demonstrates eye/hand coordination and manual dexterity with power torque-producing tools.
- 7.3.C Uses safe operating practices with power torque-producing tools.
- 7.3.D Inspects and maintains power torque-producing tools.
- 7.4.A Selects the appropriate power grinding and shaping tool, e.g., sanders and grinders.
- 7.4.B Demonstrates eye/hand coordination and manual dexterity with power grinding and shaping tools.
- 7.4.C Uses safe operating practices with power grinding and shaping tools.
- 7.4.D Inspects and maintains power grinding and shaping tools.
- 7.5.A Selects the appropriate power clamping tool, e.g., air clamps.
- 7.5.B Demonstrates eye/hand coordination and manual dexterity with power clamping tools.
- 7.5.C Uses safe operating practices with power clamping tools.
- 7.5.D Inspects and maintains power clamping tools.
- 7.6.A Selects the appropriate power pulling and lifting tool, e.g., electric hoists and power jacks.
- 7.6.B Demonstrates eye/hand coordination and manual dexterity with power pulling and lifting tools.
- 7.6.C Uses safe operating practices with power pulling and lifting tools.
- 7.6.D Inspects and maintains power pulling and lifting tools.

SAMPLE PERFORMANCE TASKS

These are sample projects of the type and scale recommended to address one or more of the learning expectations for this standard. Other projects can be used at the instructor's discretion.

- Attach gypsum board to a wood frame wall using sheet rock screws, using a power driver.
- Grind concrete surface using an electric grinder.
- Drill holes for and install expanding anchor bolts into concrete using hammer drill and impact wrench.
- Use air clamps to secure work pieces.
- Use electric hoists to reposition heavy materials.

INTEGRATION/LINKAGES

SkillsUSA-VICA *Professional Development Program*, SkillsUSA-VICA, Communication and Writing Skills, Teambuilding Skills, Research, Language Arts, Sociology, Psychology, Algebra, Geometry, Applied Communication, Social Studies, Problem Solving, Interpersonal Skills, Employability Skills, Critical-Thinking Skills, SCANS (Secretary's Commission on Achieving Necessary Skills), NCCER, Chamber of Commerce, Colleges, Universities, Technology Centers, and Employment Agencies

CONSTRUCTION CORE

STANDARD 8.0

Students will make and lay out linear and angular measurements.

LEARNING EXPECTATIONS

The student will:

- 8.1 Makes accurate linear measurements.
- 8.2 Makes accurate angular measurements.
- 8.3 Makes accurate two-dimensional layouts specified with linear and angular dimensions.
- 8.4 Makes accurate three-dimensional layouts specified with linear and angular dimensions.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 8.1.A Uses steel tape and square to lay out cuts in framing lumber to an accuracy of $\frac{1}{16}$ inch.
- 8.1.B Makes horizontal site layout measurements over 100 feet to an accuracy of $\frac{1}{8}$ inch using a steel tape and plumb bob.
- 8.1.C Measures dimensions of objects less than 1 foot to an accuracy of $\frac{1}{32}$ inch.
- 8.1.D Makes small linear measurements, such as wire diameter, to an accuracy of 0.001 inch.
- 8.2.A Makes angular measurements typical of framing to an accuracy of 1 degree, e.g. using a framing square or protractor.
- 8.2.B Makes angular measurements typical of site layout to an accuracy of 0.1 degree, e.g., using a builder's level or transit.
- 8.3.A Lays out locations of walls, windows, doors, and other structural elements specified in two dimensions.
- 8.3.B Lays out curvilinear boundaries, such as for driveways and patios specified in two dimensions.
- 8.4.A Lays out site locations and elevations specified in three dimensions.

SAMPLE PERFORMANCE TASKS

These are sample projects of the type and scale recommended to address one or more of the learning expectations for this standard. Other projects can be used at the instructor's discretion.

- Construct batter boards and lay out a foundation plan based on a construction drawing, including grade stakes and locations of concrete forms, e.g., using stakes, hammers, steel tapes, and builder's levels.
- Measure all markings on a basketball (or other) court and verify that they meet regulations.
- Given a loose set of assorted twist drill bits, measure and tag their diameters, and sort by size.
- Lay out cuts on 2×4 or 2×6 lumber to make a regular octagon.
- Lay out the corner locations for a hexagonal gazebo foundation.

INTEGRATION/LINKAGES

SkillsUSA-VICA *Professional Development Program*, SkillsUSA-VICA, Communication and Writing Skills, Teambuilding Skills, Research, Language Arts, Sociology, Psychology, Algebra, Geometry, Applied Communication, Social Studies, Problem Solving, Interpersonal Skills, Employability Skills, Critical-Thinking Skills, SCANS (Secretary's Commission on Achieving

Necessary Skills), NCCER, Chamber of Commerce, Colleges, Universities, Technology Centers,
and Employment Agencies

CONSTRUCTION CORE

STANDARD 9.0

Students will transfer mathematics concepts to solve problems encountered in the construction industry.

LEARNING EXPECTATIONS

The student will:

- 9.1 Apply geometric and algebraic concepts to calculations of areas and volumes from construction drawings.
- 9.2 Apply rate-of-change concepts to construction problems.
- 9.3 Estimate error propagation in calculations due to uncertainty in measurements.
- 9.4 Analyze the effect of interest rates on the cost of construction.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 9.1.A Calculates and estimates areas of irregular polygons and surfaces with complex curved boundaries from construction drawings, including such things as floors, walls, and roof surfaces.
- 9.1.B Calculates and estimates volumes of structural elements having regular and irregular geometric shapes, such as concrete required to construct slabs, columns, and beams.
- 9.1.C Estimates the number of unit material required from area and volume calculations, such as tiles and bricks.
- 9.2.A Calculates total rise and run from grade descriptions.
- 9.2.B Calculates the length of roof rafters from span and slope data.
- 9.2.C Calculates the grade given horizontal run and elevation change data, such as for a paved surface.
- 9.3.A Estimates the uncertainty in volume and area calculations, such as concrete required for a slab due to uncertainty in the grade under the slab.
- 9.3.B Determines which error in three given dimensions of a rectangular prism has the greatest effect on the volume of the prism.
- 9.4.A Estimates the impact of lost time on total cost of a construction loan, such as a delay due to bad weather.
- 9.4.B Calculates the interest cost of a construction loan at typical current rates, for a specified construction job.
- 9.4.C Compares a contractors cost-of-operating money for a given construction job on the basis of a pay-on-completion contract versus a specific draw-on-progress contract.

SAMPLE PERFORMANCE TASKS

These are sample projects of the type and scale recommended to address one or more of the learning expectations for this standard. Other projects can be used at the instructor's discretion.

- Make a material take-off for a single specialty area (e.g., framing, electrical, masonry, etc.) from data on construction drawings.
- Calculate the volume of air in auditoriums, meeting rooms, sales, or work areas from data in construction drawings.
- Estimate the maximum and minimum volume of concrete required for a ground level slab based on construction drawings and expected uncertainty in the grade of back fill.

- Estimate the additional plaster material used if the plaster is 1/8 inch thicker than specified in the construction drawings.
- Estimate the cost of 20 days of lost construction time for a specified loan and specified list of fixed costs.
- Estimate the volume of earth to be removed to dig a horizontal ditch in land with varying terrain elevation as specified in construction drawings.
- Estimate the number of truck loads of fill material required to raise the elevation of a 250,000 ft² warehouse foundation by 5 ft.

INTEGRATION/LINKAGES

SkillsUSA-VICA Professional Development Program, SkillsUSA-VICA, Communication and Writing Skills, Teambuilding Skills, Research, Language Arts, Sociology, Psychology, Algebra, Geometry, Applied Communication, Social Studies, Problem Solving, Interpersonal Skills, Employability Skills, Critical-Thinking Skills, SCANS (Secretary's Commission on Achieving Necessary Skills), NCCER, Chamber of Commerce, Colleges, Universities, Technology Centers, and Employment Agencies

CONSTRUCTION CORE

STANDARD 10.0

Students will rig and move materials and equipment.

LEARNING EXPECTATIONS

The student will:

- 10.1 Inspect rigging equipment.
- 10.2 Analyze crane hand signals.
- 10.3 Estimate size, weight, and center of gravity.
- 10.4 Demonstrate tying common knots used for rigging operations.
- 10.5 Evaluate various wire rope slings used for rigging operations.
- 10.6 Analyze various types of derricks.
- 10.7 Analyze types of cranes.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 10.1.A Identifies and determines the use of each piece of rigging equipment.
- 10.1.B Practices safe inspection of rigging equipment.
- 10.1.C Passes with 100% accuracy a written examination relating specifically to rigging safety issues.
- 10.1.D Passes with 100% accuracy a performance examination relating specifically to rigging.
- 10.1.E Maintains a portfolio record of written safety examinations and equipment examinations for which the student has passed an operational checkout by the instructor.
- 10.2 Demonstrates crane hand signals.
- 10.3.A Explains and demonstrates the most accurate way to determine the size of an object.
- 10.3.B Identifies and explains the center of gravity of an object.
- 10.3.C Demonstrates finding the center of gravity of an object.
- 10.3.D Explains and demonstrates ways to estimate the weight of an object.
- 10.4 Ties various knots used in rigging operations and tests for strength.
- 10.5 Identifies and explains various wire rope fittings and slings.
- 10.6 Compares and contrasts various types of derricks.
- 10.7.A Compares and contrasts the various types of cranes.
- 10.7.B Compares hydraulic cranes and mechanical cranes.

SAMPLE PERFORMANCE TASKS

- Determine size and weight of an object.
- Determine the center of gravity of an object.
- Practice tying various knots.
- As a team demonstrate crane hand signals and the result of each signal.
- Determine the capacity of a crane.
- Determine the working radius of a crane.
- Attach rigging to a load.
- Lift load and move to a new position.
- Disconnect the rigging and store in proper place.
- Practice rigging and moving materials and equipment.

INTEGRATION/LINKAGES

Research and Writing Skills, Math, Math for Technology, Geometry, Applied Communication, Precision Measurements, SCANS (Secretary's Commission on Achieving Necessary Skills), Communication Skills, Teamwork and Leadership Skills, Language Arts, *Professional Development Program*, SkillsUSA-VICA, Knot Tying Skills, , Critical-Thinking Skills, ABC (Associated Builders and Contractors), AGC (Associated General Contractors, NCCER (National Center for Education and Research, Department of Labor and Workforce Development, Labor Unions (AFL-CIO, IBEW), OSHA (Occupational Safety and Health Administration), TOSHA (Tennessee Occupational Safety and Health Administration)

CONSTRUCTION CORE

STANDARD 12.0

Students will demonstrate proficiency in creating two- and three-dimensional scale drawings.

LEARNING EXPECTATIONS

The student will:

- 12.1 Create accurate and complete manual scale drawings of two-dimensional objects and two-dimensional plans.
- 12.2 Apply drawing dimensioning rules using basic measurement systems.
- 12.3 Create complete orthographic projections of simple three-dimensional objects.
- 12.4 Create complete orthographic projections of complex three-dimensional objects.
- 12.5 Analyze the use of a computer-aided drafting software program to draw two- and three-dimensional objects.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 12.1.A Makes scale drawings of given two-dimensional objects, including floor plans and equipment.
- 12.1.B Annotates drawings with labels and dimensions using basic manual lettering styles and techniques.
- 12.1.C Creates and completes title blocks on drawings.
- 12.2.A Applies dimensioning rules, such as avoiding redundancy and dimensioning to hidden lines, dual dimensions, and properly indicated tolerances.
- 12.2.B Uses basic measurement systems including fractions, decimals, English, and metric.
- 12.3.A Makes orthographic pencil drawings of simple three-dimensional objects, including appropriate dimensioning and auxiliary and sectional views.
- 12.3.B Uses hidden lines to show internal or hidden features of simple three-dimensional objects.
- 12.4.A Makes orthographic pencil drawings of complex three-dimensional objects, including appropriate dimensioning and auxiliary and sectional views.
- 12.4.B Uses hidden lines to show internal or hidden features of complex three-dimensional objects.
- 12.6 Compares the manual and electronic methods of preparing drawings.

SAMPLE PERFORMANCE TASKS

- Complete a manual scale drawing of classroom floor plan.
- Complete a scale drawing of fire escape routes for each floor of school building.
- Complete a manual drawing of custom-shaped metal/wooden blocks.
- Complete a drawing of the teacher's desk.
- Create a scale drawing of a floor plan of school auditorium using a CAD program.

INTEGRATION/LINKAGES

Foundation for Industrial Modernization (FIM), National Occupational Skill Standards for Computer-Aided Drafting and Design (CADD), National Center for Construction Education and Research (NCCER), Math Skills, Computer Science Skills

CONSTRUCTION CORE

RESOURCES

- National Center for Construction Education and Research (NCCER), *Core Curriculum*. Prentice Hall, Upper Saddle River, NJ; ©2000—www.nccer.org
- The Associated General Contractors of America—*Constructor, The Construction Management Magazine*
- The Associated Builders and Contractors of America
- United States Department of Labor
- Tennessee Department of Labor and Workforce Development
- United Brotherhood of Carpenters Apprenticeship and Training Fund of North America
- International Brotherhood of Electrical Workers
- *Total Quality Curriculum*, National SkillsUSA-VICA
- Professional Development Program, National SkillsUSA-VICA—www.vica.org